

SCIENCE

And Technology Program



Douglas C. Andersen and David J. Cooper

FY 1999 - FY 2000

Maintaining or restoring riparian cottonwood stands is an important concern for Upper Colorado Region managers attempting to meet both environmental and human water resource needs. Research published during 1999 in the journal, *Regulated Rivers: Research and Management* (Cooper, D. J., D. M. Merritt, D. C. Andersen, and R. A. Chimner, The role of biotic and abiotic factors in establishment of Fremont cottonwood seedlings, volume 15, pages 419-440) suggests that appropriate river hydrology is a necessary but not a sufficient condition for successful establishment of cottonwood on both regulated and unregulated rivers. This research also suggests that the set of additional conditions required for successful establishment differs between regulated and unregulated rivers. In particular, within arid and semi-arid regions, appropriate soil texture appears critical on unregulated rivers featuring large stage change. Further, cottonwood and saltcedar, an invasive exotic woody plant, form mixed seedling beds because of overlapping periods of seed dispersal and similarity in germination requirements. Differences in root development patterns, shade-tolerance, or water-use efficiency likely will promote one species over the other, but the nature of these differences has not been determined.

The proposed study is intended to accomplish three goals: (1) Establish whether Fremont cottonwood is strictly shade-intolerant. (2) Demonstrate whether, and in what context, surface (0-40 cm) soil texture is critical for successful cottonwood establishment. (3) Determine the manner in which soil texture and soil moisture conditions affect the outcome of competition between saltcedar and cottonwood seedlings.

The results of this study will provide criteria for selecting (1) off-channel, cottonwood regeneration sites on the basis of soil texture and (2) instream flows to promote cottonwood seedlings over saltcedar seedlings in situations where they are competing for limited resources.

During summer 1999, we initiated preliminary studies to determine the locations, soil textures, and soil water content at sites where tamarisk and cottonwood seedlings were naturally establishing in Brown's Park, on the regulated Green River, and Deerlodge Park, on the unregulated Yampa River. We monitored the soil water content repeatedly during the summer in locations where cottonwood seedlings established in stands of existing cottonwood saplings, tamarisk saplings, and in herbaceous vegetation. Field plots were thinned to control for seedling density. These data indicate a strong dependancy of seedlings on fine-textured soils. These preliminary analyses indicate that shade is not a factor excluding seedlings from establishing, but competition for soil water is a factor. Plots on sandy soils had 100 percent mortality of cottonwood seedlings in both Brown's Park and Deerlodge Park where the water table was more than 40 cm below the soil surface.

The data collected will be used to design the soil texture and shade treatments for experiments to be conducted in the field during summer 2000.